

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Rorippa subumbellata*

COMMON NAME: Tahoe yellow cress

LEAD REGION: Region 8

INFORMATION CURRENT AS OF: October 2005

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: February 8, 2001

☐ 90-day positive - FR date:

☐ 12-month warranted but precluded - FR date:

☐ Did the petition request a reclassification of a listed species? No

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

The petition received in February 2001 to list *R. subumbellata* as an endangered species under the Endangered Species Act was largely based on the restricted distribution of the species, a declining trend in the numbers of sites and individuals observed, and the inadequacy of existing regulatory mechanisms (League to Save Lake Tahoe and Center for Biological Diversity 2000). We considered the petition in this assessment and incorporated information from the petition where appropriate. A conservation strategy has been developed to address the threats to this species and coordinate management and conservation activities. Implementation of the strategy is currently underway and, if successful, is expected to preclude the need to list *R. subumbellata*.

We find that the immediate issuance of a proposed rule and timely promulgation of a final rule for this species has been, for the preceding 12 months, and continues to be, precluded by higher priority listing actions (including candidate species with lower LPNs). During the past 12 months, almost our entire national listing budget has been consumed by work on various listing actions to comply with court orders and court-approved settlement agreements, emergency listings, and essential litigation-related, administrative, and program management functions. We will continue to monitor the status of this species as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures. For information on listing actions taken over the 12 months, see the discussion of "Progress on Revising the Lists," in the current CNOR which can be

viewed on our Internet website (<http://endangered.fws.gov/>).

___ Listing priority change

Former LP: ___

New LP: ___

Date when the species first became a Candidate (as currently defined): Oct 25, 1999

___ Candidate removal: Former LPN: ___

___ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.

___ F – Range is no longer a U.S. territory.

___ I – Insufficient information exists on biological vulnerability and threats to support listing.

___ M – Taxon mistakenly included in past notice of review.

___ N – Taxon does not meet the Act's definition of "species."

___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering Plants, Brassicaceae (Mustard Family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Nevada and California

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE:
Washoe, Carson, and Douglas Counties, Nevada, and El Dorado and Placer Counties, California

LAND OWNERSHIP: Populations occur on lands under management by a variety of agencies and entities, including the U.S. Forest Service (25 percent); California Tahoe Conservancy, California Department of Parks and Recreation, Nevada Division of State Parks, and other county, and city parks (25 percent); and private landowners (50 percent). These agencies and entities are described under Factor D.

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LEAD FIELD OFFICE CONTACT: Steve Caicco, Nevada FWO, & (775) 861-6341; Roberta Gerson, Sacramento FWO, (916) 414-6630

BIOLOGICAL INFORMATION

Species Description: *Rorippa subumbellata* is a member of the mustard family (Brassicaceae) known only from the shores of Lake Tahoe. The species is a decumbent, somewhat fleshy, herbaceous perennial that branches profusely. Leaves are generally oblong and deeply pinnately lobed. The inflorescences are umbel-like and elongate. Flowers are yellow and flowering occurs between late May and late October. Fruit and seed development is continuous during the flowering period, truncated by inundation or the first winter frost. Fruits are typically oblong

and weakly inflated.

Taxonomy: E.L. Greene first collected *Rorippa subumbellata* prior to 1891. Greene mistakenly identified the specimen as *Rorippa sinuata*, which is widespread west of the Mississippi River, but has not been documented in the Lake Tahoe basin. The current treatment of the genus *Rorippa* in Hickman, ed. (1993) recognizes about 75 species worldwide, with 21 native to North America and 7 introduced, naturalized species on the continent. Eleven species are known from California, one of which is introduced from Europe and one is known to be worldwide in distribution (*Rorippa nasturtium-aquaticum*). Eight species are known from Nevada. All are associated with open, damp, or wet habitats such as springs, marshes, meadows, and shores or banks of lakes, streams, and rivers that are often naturally disturbed by flowing water (Pavlik *et al.* 2002). Current information on taxonomic validity was reviewed on the Jepson Flora Project website; *Rorippa subumbellata* is the accepted name for a taxon native to California valid taxonomic name (http://ucjeps.berkeley.edu/cgi-bin/get_cpn.pl?41603&expand=1); website accessed on October 31, 2005).

Habitat/Life History: *Rorippa subumbellata* occurs on sandy substrates, in silty soils among boulders, along lake margins, near stream mouths, in organically enriched dune slacks, and in back-beach depressions in naturally dynamic environments (Knapp 1979a; Ferreira 1987; Pavlik *et al.* 2002). Physical processes such as wave action, lake level fluctuations, and the erosive forces of the wind heavily influence substrate characteristics. Soil moisture, an important determinant of species distribution, is strongly influenced by lake level. Moisture also influences the colonization of sites by other plant species that may compete with *R. subumbellata* for resources (California State Lands Commission (CSLC) 1998; Pavlik *et al.* 2002).

Presence and availability of suitable habitat for *R. subumbellata* are both correlated with lake level. The natural rim of Lake Tahoe is located at 6,223 feet (ft) (1,897 meters (m)) elevation. A dam constructed in 1871 at the Truckee River outflow increased lake capacity to 6,229 ft (1,899 m) in elevation, and the lake level is regulated between the two surface elevations by dam operations in response to downstream demands. In accordance with the Truckee River Agreement, the legal maximum lake elevation is 6,229.1 ft (1,898.6 m). In extended periods of drought, such as in the late 1980s, early 1990s, and early 2000s, the lake level dropped close to or below the natural rim, exposing additional shoreline habitat. In early January 1997, following extensive regional flooding, Lake Tahoe reached an elevation of 6,229.4 ft (1,898.6 m), more than 6 ft (2 m) over the natural rim, and the highest level since 1920. At these surface elevations, very little potentially suitable habitat for *R. subumbellata* is exposed. Lake levels remained relatively high through the 1999 growing season and subsequently began to recede as a result of drought conditions. Many previously inundated sites were relocated during the 2001, 2002, and 2003, 2004, and 2005 lake-wide surveys (CSLC 2002, 2003; Service 2004).

Historical Range/Distribution: Range-wide surveys for *R. subumbellata* populations were not conducted prior to 1979, thus information on the complete historical distribution of *R. subumbellata* is lacking. Pre-1950 records of historical occurrence included 10 sites on the Lake Tahoe shoreline. Survey efforts have been undertaken periodically since 1979 to determine range-wide distribution, status, and population trends of *R. subumbellata* (Knapp 1979a, 1979b,

1980; Ferreira 1987; Tahoe Regional Planning Agency (TRPA) unpublished data, 1994; Pavlik *et al.* 2002). Because counting methods varied among surveyors, and seasonal timing of surveys was found to influence plant numbers observed, comparison of numbers of individual plants observed among years was not considered statistically valid until recently when a standardized survey method was developed (Pavlik *et al.* 2002). In addition, vegetative reproduction in this species confounds the surveyors' ability to determine the actual number of individuals; therefore, the aboveground portion of the plant (referred to as "stems") was counted (CSLC 1998; Pavlik *et al.* 2002).

Data collected over the last 25 years indicate a relationship between lake level and site occupancy by *R. subumbellata* (Pavlik *et al.* 2002; CSLC 2002, 2003; Service 2004). The data generally show that species occurrence fluctuates yearly in response to lake level which determines the amount of exposed habitat. In high water years, many sites are inundated and therefore unavailable for that year's plant growth. In low water years, more habitat is exposed and available for colonization. Records kept since 1900 indicate a preponderance of years with high lake levels that would isolate and reduce *R. subumbellata* occurrences to higher beach elevations. Approximately 7 high-level peaks, encompassing 53 years, can be delineated from the record, including 29 years that exceeded the legal upper limit of 6,229.1 ft (1,898.6 m) (Pavlik *et al.* 2002). In comparison, there were about 5 low-level troughs comprised of 32 years, with only 21 years that were at or below the lake's natural rim (6,223 ft; 1,897 m) (Pavlik *et al.* 2002). From the species' standpoint, less favorable peak years have occurred almost twice as often as more favorable, low level years. In addition, there has been widespread and intensive use of the shore zone since European settlement (Pavlik *et al.* 2002). Historically, this use was related to logging and grazing. Today, use of the shoreline is from recreation, boating, construction of piers and boat launches, and dam operations that change lake elevation (CSLC 1998) (see Threats section below).

In 1993, a low-water year when lake elevation averaged 6,223 ft (1,897 m), plants numbering in the thousands were documented at 35 general locations, which was the largest number of occurrences ever documented in one year to date (CSLC 1998). Subsequent years saw higher lake levels and the number of occupied sites declined, apparently due, in part, to habitat inundation. Factors other than inundation played a part in the decline, because populations were also absent from some higher elevation sites that were not inundated. Preliminary information indicates that habitats inundated by higher lake elevations also experience increased, concentrated recreational use that appears to negatively impact plant populations (see Threats section below). In 1995, only 8 of the 35 generalized locations known from 1993 were occupied. While lake-wide surveys were not conducted in 1996, surveys of the 15 sites most likely to support plants revealed the presence of *R. subumbellata* at only 5 sites (CSLC 1998). Results of surveys conducted between 1997 and 2000 followed similar patterns of low occupancy for years with high lake levels; an average of 38 sites were surveyed each year during this time period, and only 8 to 14 sites supported the species (Pavlik *et al.* 2002).

Following the 2001 annual surveys, an analysis of data collected between 1979 and 2001 was performed to determine if there is a relationship between how many sites are surveyed and the number of sites where Tahoe yellow cress is observed, as well as provide a comparison between

low and high lake elevation years (CSLC 2002). This analysis was also applied to the 2002 survey data (CSLC 2003). The analysis showed that as the number of sites surveyed increased, particularly in low lake elevation years, the probability of observing Tahoe yellow cress at more sites was greater. Results of this analysis were statistically significant ($P < 0.01$) and strongly support this hypothesis. The results also demonstrated that there is a statistically significant negative relationship between high lake elevations and the presence of Tahoe yellow cress during the survey period, which is consistent with the findings in Pavlik *et al.* (2002).

Current Range/Distribution. Lake levels began to recede in 1999, and by the 2001 growing season, the lake elevation was near the natural rim, exposing hundreds of acres of habitat. During the 2001 surveys, of 58 sites visited, 30 sites had been colonized (CSLC 2002). In 2002, which saw the lowest recorded lake levels since 1994, survey efforts were intensified and of the 71 sites surveyed, 48 supported *R. subumbellata* (CSLC 2003). In 2003 and 2004, lake levels remained low, and of 69 sites surveyed, 45 supported plants (Service 2004). Lake levels were higher in 2005 and many areas exposed in previous years were submerged at the time of the surveys. No summary data is presently available on the 2005 status.

Population Estimates/Status; As stated above, the lake elevation has been low for the four consecutive years since 2001, which provides extensive available habitat along the shore zone for *R. subumbellata* to colonize. The low lake elevations coupled with increased search efforts have resulted in the greatest number of occupied sites observed since the inception of lake-wide surveys. Over time, the number of stems at each site has ranged from one into the thousands. While some sites consistently support hundreds of stems, depending upon lake level, many sites typically support very few plants. Approximately 25,200 stems were counted or estimated in 2003, whereas during the 2000 annual survey when lake levels were high, the total estimated number of stems was 4,590 at 15 sites. These data demonstrate the natural fluctuations of *R. subumbellata* occurrences are a function, in part, of lake elevation and available habitat (Pavlik *et al.* 2002). To reduce work effort, the counting methodology was changed in 2004, when all plants within 6 inches of any other plant were considered to be one individual. This resulted in a total number of fewer individuals at most sites. This change proved unworkable in practice and was discontinued for the 2005 surveys. No summary results are available for 2005, but the total number of individuals is expected to be lower than from 2001-2003 because of higher lake levels.

The long-term persistence of *R. subumbellata* is possible because of a metapopulation dynamic in which extirpation is countered by colonization. New unoccupied sites can be colonized, historic sites can be recolonized or extirpated, and the timing and probabilities of these events are influenced by many factors, such as propagule longevity, dispersal mechanisms, and site suitability and availability (Pavlik *et al.* 2002). Based on these data, the species appears to be stable and will remain so provided suitable habitats are available for colonization.

DISTINCT POPULATION SEGMENT (DPS) Not Applicable.

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range. As previously described, *R. subumbellata* occurs in a dynamic environment controlled by both natural processes and human activities. Habitat occurrence and suitability are influenced by physical processes such as fluctuations in lake elevations, wave-induced beach erosion, or changes in stream channel orientation, all of which may eliminate or create suitable substrates for plant growth (CSLC 1998; Pavlik *et al.* 2002). Substrate moisture also influences the occurrence of *R. subumbellata*, as well as competition with other plant species for space, light, nutrients, and other plant requirements (Ferreira 1987). Under natural conditions, *R. subumbellata* is apparently tolerant of the dynamic nature of its habitat and adapted for survival in a disturbance regime. However, given the incidence of lake level control by damming and other human activities, habitat conditions are not natural (CSLC 1998).

Human activities affect both *R. subumbellata* and its habitat. While the species was observed at 35 general locations in 1993 (CSLC 1998), 30 locations in 2001 (CSLC 2002), and 48 locations in 2002 (the highest recorded number of occurrences in a given year (CSLC 2003), comparison of historical occurrence records with present-day records indicates that *R. subumbellata* has been permanently extirpated from at least 6 historic sites and is present only sporadically at 17 sites (Pavlik *et al.* 2002). The majority of the remaining sites are used for commercial and public purposes and subject to various activities such as erosion control, marina developments, pier construction, and recreation.

Recreational use of the public beaches at Lake Tahoe constitutes the greatest threat to *R. subumbellata* and its habitat. Many public beaches, which support the largest occurrences of the species, are filled to capacity during the summer months, and heavy recreational use results in compaction and mixing of sandy substrates and destruction of the armor layer (CSLC 1998). The U.S. Forest Service (USFS), California Tahoe Conservancy (CTC), and California Department of Parks and Recreation (CDPR) have management programs for *R. subumbellata* that includes monitoring, fenced enclosures, and transplanting efforts when funds and staff are available. The major colonies of *R. subumbellata* occurring on beaches managed by these agencies have persisted over time. However, because the continued existence of this species is dependent upon a metapopulation dynamic, it is essential that occupied and suitable sites on public, as well as private lands be protected (Pavlik *et al.* 2002).

Prospects for continued survival of *R. subumbellata* on high-use beaches have been evaluated by examining available information on past and present recreational use of Lake Tahoe's public beaches for indications of future trends. Sites occupied by *R. subumbellata* differ greatly in their level of recreational visitation. Visitation at five Nevada State Parks ranges between 750,000 and 1 million visitors per year (1989 to 2000), with similar levels at California State Parks and USFS lands in the basin (Pavlik *et al.* 2002). Data are not available for privately owned sites, but presumably the levels of use would be substantially lower than on publicly managed sites. Activities that encourage foot traffic along heavily visited beaches have the most deleterious impacts on *R. subumbellata* and its habitat (Pavlik *et al.* 2002). Demands for beach recreation are expected to increase as a result of urban population growth in Nevada and on the western slope of the Sierra Nevada. Resource managers have observed upward trends in day use in the Tahoe basin and predict that use will increase over time. Local planners are investigating

alternative modes of transportation (e.g. bike trails, water taxi services, etc.), to increase access to the public beaches (Jerry Dion, TRPA, pers. comm. 2001). Resultant increased access to the public beaches may increase disturbance and loss of *R. subumbellata* and its habitat.

Human-created disturbances in the shore zone of Lake Tahoe also contribute to the loss and degradation of *R. subumbellata* and its habitat. Structures that extend into the water are a possible deterrent to the natural transport of sand along the shoreline, which may decrease beach habitat. This includes boat launches, piers, and marinas. Unnaturally high lake levels seem to alter the natural erosion process, which creates an unstable shoreline and deep-water pockets on that portion of the shoreline. *Rorippa subumbellata* is then unable to follow the receding lake level and potentially cannot recolonize those portions of shoreline (CSLC 1998).

Increased beach activity, combined with high lake levels, threatens *R. subumbellata* persistence. It has been speculated that as lake levels receded populations would recolonize previously inundated areas. While this has been observed at many sites, it is not true for all suitable habitat around the lake. The heavy recreational use concentrated on a small portion of the beach habitat negatively affects the plant's ability to reestablish (CSLC 1998).

Approximately half of the populations of *R. subumbellata* that have been monitored over time occur on privately owned beaches overlain by a public trust easement which permits beach use by the public where access is available. Much of the habitat on the private land sites is in good condition. However, some of these beaches are used for boat storage and are periodically raked by the property owners to provide a uniform surface for recreational activities; in the process, larger pebbles, cobbles, and boulders are removed. This practice degrades substrate structure and moisture-holding capacity, both important habitat characteristics for *R. subumbellata* (CSLC 1998).

Although *R. subumbellata* appears well adapted to its dynamic shorezone environment and is capable of recolonizing sites after periods of inundation, the threat of human activities identified above remain during both high and low lake levels. Proposals for construction of new piers and pier extensions, marina expansions, and revetment repairs and replacements are continuously being submitted to permitting agencies (Mike Vollmer, TRPA, pers. comm. 2004). Future losses or degradation of potential habitat may greatly affect the metapopulation dynamic upon which this species relies for its continued survival (Pavlik *et al.* 2002).

B. Overutilization for commercial, recreational, scientific, or educational purposes. Sites previously or currently used for recreation are highly disturbed.

C. Disease or predation. No known threats.

D. The inadequacy of existing regulatory mechanisms. Activities in the Lake Tahoe basin, including use within the shorezone, on both public and private lands, are regulated under various agency policies and management directions, many of which include provisions for protection of

R. subumbellata. However, despite the myriad of potential protective mechanisms, current regulatory protection alone is not adequate.

The Service identified *Rorippa subumbellata* as a category 1 candidate for listing on December 15, 1980 (45 FR 82479), indicating sufficient information on biological vulnerability and threats were available to support preparation of a listing proposal. During a 1994-1995 periodic review, the Service assessed the need to propose *R. subumbellata* for listing. During that same period, a regional drought resulted in a significant drop in lake elevation, which exposed large expanses of suitable habitat. The species responded by colonizing many of these areas. As a result of this response, as well as changes to the Service's method of categorizing candidate species, *R. subumbellata* was downgraded from category 1 status to a species of concern in 1996 (61 FR 7595). Subsequent high water years and increased recreation within *R. subumbellata* habitats again reduced the number of occupied sites around the lake. Following an updated status assessment of *R. subumbellata* and its increasing vulnerability to threats, we included this taxon as a candidate species in the Candidate Notice of Review published on October 25, 1999 (64 FR 57533).

Rorippa subumbellata is listed as an endangered species under the California Endangered Species Act (CESA). Lead State agencies are required to consult with California Department of Fish and Game (CDFG) to determine whether projects under their purview would jeopardize the continued existence of any listed species. If detrimental effects on the species are likely to occur, CDFG is responsible for developing project alternatives consistent with conservation of the species. However, State law requires only that the landowner notify the agency at least 10 days in advance of changing the land use to allow salvage of listed plants. Successful salvage and transplanting of this species has not been documented to date.

The Tahoe Regional Planning Compact of 1969 (P.L. 96-551), as revised, established the TRPA, a bi-state entity authorized to develop environmental threshold carrying capacities for the Tahoe basin, which are to be achieved through the development of a regional plan and implementing ordinances. All applications for shorezone development are reviewed by TRPA to ensure that *R. subumbellata* populations and habitats are not disturbed. Shorezone activities regulated by TRPA include construction of new structures (e.g. piers, jetties, breakwaters, boat ramps, boat houses, fences, buoys, shoreline protective structures, and marinas); modifications (e.g. major structural repair, reconfiguration, and expansions) and other activities, including salvage operations, tour boat operations, water borne transit, and seaplane operations. The TRPA also has developed beach-raking guidelines, which discourage beach raking within known habitats of *R. subumbellata*. TRPA's regulation of shorezone activities is intended to ensure that projects on all lands requiring permits do not have deleterious impacts on *R. subumbellata* and its habitat. However, TRPA apparently lacks sufficient permit compliance and enforcement personnel to ensure that permit conditions are adhered to, or personnel to work with land managers and landowners to ensure adherence to the beach raking policy.

The CSLC administers the State's fee ownership to the bed of Lake Tahoe from 6,223 ft (1,897 m) elevation lakeward and a public trust easement between 6,223 ft (1,897 m) and 6,228.75 ft (1,898.52 m) elevation. Public and private entities must apply to CSLC for permits to construct

marinas and other structures on State lands or waters. In consultation with CDFG, CSLC provides review under the California Environmental Quality Act (CEQA) and CESA for discretionary projects in the shorezone and requires mitigation for all projects under their jurisdiction. Again, CESA does not ensure the continued survival of individual populations.

The CDPR is also required, under CEQA and CESA, to manage populations of *R. subumbellata* on California State Park lands so as to ensure that their actions do not jeopardize the species. Ongoing management for *R. subumbellata* at Emerald Bay and D. L. Bliss State Parks includes annual monitoring of all populations and habitats. Past efforts have included reintroduction of an extirpated population on Lester Beach at Bliss State Park through a program of outplanting, fencing, and monitoring.

Rorippa subumbellata is designated as a critically endangered species by the State of Nevada, and under Nevada Revised Statutes 527.270 *et seq.*; the species may not be removed or destroyed except under special permit issued by the Nevada Division of Forestry. In the course of issuing permits, efforts are typically made to minimize or eliminate deleterious effects on State-listed species through project modifications. The adequacy of this law depends on informed and cooperative landowners, or on deterrent enforcement. However, there are no State protocols in place informing landowners of the presence of critically endangered species on their lands, and deterrent enforcement does not currently exist.

Rorippa subumbellata is also included on the list of USFS sensitive species. The USFS develops and implements management practices that ensure species do not become threatened or endangered as a result of their actions. Management activities for *R. subumbellata* on USFS lands have included annual surveys, construction of enclosures around major occurrences, and transplanting programs. The commitment to such programs by the USFS is highly dependent upon annual staffing and other priorities in the Tahoe basin. Efforts to manage the species have improved over the past 4 years; a permanent botanist position was filled and the program has consistently been funded. Projects have included the construction of a number of enclosures to protect the species and placement of informative signs on the enclosures and elsewhere to educate the public.

The NatureServe network includes Natural Heritage Programs that operate throughout the United States, as well as in Canadian, Latin America, and the Caribbean. Natural Heritage ranks reflect the rarity and vulnerability of species on a global (G-rank) and a state scale (S-rank). These ranks are based on a scale of 1 to 5, with 5 indicating the species is widespread and secure and 1 indicating the species is imperiled. *Rorippa subumbellata* is currently ranked G1, S1. While this ranking has no regulatory implications, it provides resource managers the ability to objectively track sensitive species that may occur on lands under their purview.

E. Other natural or manmade factors affecting its continued existence. Lake level fluctuations between elevations of approximately 6,223 and 6,229 ft (1,897 and 1,899 m) result from operation of the Truckee River dam at the outflow of Lake Tahoe at Tahoe City. The dam is operated in accordance with procedures negotiated in the Truckee River Agreement, which provides releases to meet downstream demands. In periods of drought, the lake may drop below

its natural rim of 6,223 ft (1,897 m) elevation during the non-runoff portions of the year. Holding lake surface elevations at unnaturally high levels during the growing season appears to negatively affect *R. subumbellata* by inundating suitable habitats (Ferreira 1987; Pavlik *et al.* 2002). Recolonization after inundation has been documented in several instances. During the drought of the late 1980s and early 1990s, lake elevations remained at or below the natural rim. During that time, many newly exposed shoreline habitats were colonized by *R. subumbellata* (CSLC 1998). The duration of inundation of the low and mid-elevation sites was most extensive during the 1990s. The region subsequently experienced relatively dry winters between 1999 and 2002, and lake elevations dropped to near the natural rim, exposing previously inundated known and potentially suitable habitat. Many of these sites were colonized during the 2001, 2002, and 2003 seasons (CSLC 2002, 2003; Service 2004).

A proposed Federal action to modify operations of the Truckee River reservoirs through implementation of the Truckee River Operating Agreement (TROA) is presently being negotiated by the Secretary of the Interior in accordance with subsection 205(a) of the Truckee-Carson-Pyramid Lake Water Rights Settlement Act (P.L. 101-618). An analysis of potential effects by implementation of TROA has been completed, including an analysis of potential changes in the levels of Lake Tahoe, and possible effects on *R. subumbellata*. The analysis shows that implementation of TROA would result in slightly more habitat available under dry hydrologic conditions when compared to no action or current conditions, slightly less habitat under median hydrologic conditions during August and September when compared to no action or current conditions, and no change in available habitat during wet hydrologic conditions when compared to no action or current conditions. On average, six fewer acres of habitat would be available under median hydrologic conditions; this is a difference of less than one percent of the total potential habitat. The effects of TROA implementation were deemed to not be significant under both the National Environmental Policy Act or the California Environmental Quality Act (U.S. Department of Interior and State of California, 2004).

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

The CSLC and TRPA, in conjunction with various other Federal, State, and local partners, developed a stewardship plan which was intended to provide protection for *R. subumbellata* so that shorezone development would not be detrimental to species survival. Funds for this plan were to be derived from mitigation fees assessed on permitted development projects located within the shorezone. The effort to develop the plan and fund its implementation was underway for a period of years, and various versions of a draft plan were produced; however, acquisition of funds to complete the plan, begin implementation, and identify management actions to protect the plant was never realized.

In 1997, CSLC formed a multi-agency survey team to perform annual lake-wide surveys to determine the presence or absence of *R. subumbellata*. Agencies involved in the effort contribute various in-kind services (i.e., watercraft, Global Positioning System (GPS) units, aerial photographs, etc.) or post-survey data compilation (Pavlik *et al.* 2002). These surveys are ongoing and the data collected continue to be refined so as to inform management decisions and conservation efforts.

The USFS, CTC, and CDPR have management programs for *R. subumbellata*, which include monitoring, fenced enclosures, and transplanting efforts when funds and staff are available. Also, TRPA has developed beach-raking guidelines, which discourage beach raking within known habitats of *R. subumbellata*. TRPA's regulation of shorezone activities is intended to ensure that projects on all lands requiring permits do not have deleterious impacts on *R. subumbellata* and its habitat.

Because the Service elevated *R. subumbellata* to candidate status, a technical advisory group, which is comprised of public agencies (including the Service), private landowners, and environmental groups, was convened to develop a conservation strategy coupled with a Memorandum of Understanding/Conservation Agreement (Pavlik *et al.* 2002). Through the participation of academicians and scientists with expertise in rare plant conservation, this effort combined all of the data previously collected on *R. subumbellata* through the 2000 annual survey. This information was translated into goals and objectives for the strategy, a research and monitoring agenda, and will serve as the foundation for an adaptive management program. The strategy and agreement were completed and signed in January 2003. Parties to the strategy and agreement share responsibility in funding research and conservation activities, organizing and facilitating meetings, and participating in an annual survey effort. If successfully implemented, this strategy and associated agreement will preclude the need for the Service to list the species under the Endangered Species Act. The conservation strategy and agreement are available online at <http://www.trpa.org/Documents.htm>.

A petition to list *R. subumbellata* was received in February 2002; however, because the species was designated a candidate species for listing in 1999 (64 FR 57533), and the Service was under a listing moratorium at the time the petition was received, no action was taken. The Service responded to the petitioners on February 15, 2001.

SUMMARY OF THREATS (including reasons for addition or removal from candidacy, if appropriate)

A conservation strategy has been developed and is being implemented to address the threats to the Tahoe yellow cress. Numerous federal, state, and local agencies have signed the agreement and are actively involved in its implementation. An annual monitoring plan is in place, and research is being conducted on the genetics and population dynamics of the species, as well as propagation protocols and transplantation approaches. At this time, methods have been identified to mitigate many threats but, until the protocols have been developed to mitigate losses from individual projects through population enhancement or establishment of new populations removal from candidacy is premature. In addition, many core populations occur on private land and a planned voluntary stewardship program has yet to be implemented.

For species that are being removed from candidate status:

___ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions (PECE)?

RECOMMENDED CONSERVATION MEASURES

Continued implementation of the conservation strategy, including research and monitoring is recommended at this time. In particular, methods for population enhancement and new population establishment should be a high priority.

LISTING PRIORITY

| THREAT | | | |
|----------------------------|-----------------|-----------------------|----------|
| Magnitude | Immediacy | Taxonomy | Priority |
| High | Imminent | Monotypic genus | 1 |
| | | Species | 2 |
| | | Subspecies/population | 3 |
| | Non-imminent | Monotypic genus | 4 |
| | | Species | 5 |
| | | Subspecies/population | 6 |
| Moderate to Low | Imminent | Monotypic genus | 7 |
| | | Species | 8 |
| | | Subspecies/population | 9 |
| | Non-imminent | Monotypic genus | 10 |
| | | Species | 11 |
| | | Subspecies/population | 12 |

Rationale for listing priority number:

Magnitude: Despite the relatively high number of populations observed during the 2001, 2002, 2003, and 2004 surveys, we still have concern over increasing and intense recreational use and further development of the shorezone at Lake Tahoe. However, because of the continued commitments to conservation demonstrated by regulatory and land management agencies participating in the conservation strategy, the magnitude of threats has changed from high to moderate. The Tahoe Lake Owners Association has played an integral role in educating and engaging private landowners around the Lake Tahoe basin regarding the importance of conserving this endemic species. While regulatory agencies that oversee activities in the basin continuously receive permit applications for the construction, repair, and maintenance of boat launches, piers, and revetments, and other development that alters the shorezone, integration of the terms of the conservation strategy into permit requirements is expected to increase awareness and protection for the species. Successful implementation of the conservation strategy is necessary to keep the threats from recreation and development in check and allow the Service to reassess the LPN for *R. subumbellata*. Efforts to minimize or eliminate impacts to this species and its habitat are ongoing through implementation of this conservation strategy, which is in its

early stages. In the future, if we determine the ongoing management and conservation activities have adequately reduced or eliminated the threats to the species, the removal of *R. subumbellata* as a candidate species will be considered.

Imminence: Threats to *R. subumbellata* from various land uses such as recreational activities are currently ongoing and, therefore, imminent. In years such as 2005, when lake levels are high, recreation use in particular is concentrated within Tahoe yellow cress habitat.

Rationale for Change in Listing Priority Number (insert if appropriate)

___ Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed? Yes

Is Emergency Listing Warranted? No. As previously discussed, the development and ongoing implementation of the Conservation Strategy for Tahoe Yellow Cress (*Rorippa subumbellata*) (Pavlik *et al.* 2002) has demonstrated a commitment among regulatory and land management agencies and private landowners to actively protect this species into future. Successful long-term implementation of the conservation strategy is expected to preclude the need to list the species under the Act.

DESCRIPTION OF MONITORING

Various surveys and studies of *R. subumbellata* have been conducted on the beaches around Lake Tahoe since 1978. Many historic locations of Tahoe yellow cress have been well documented, providing long-term presence/absence data for the region (Baad 1979, 1978; Knapp 1980, 1979; Reed 1982; Ferreira 1988, 1987; CSLC 1998, 2001, 2002, 2003, 2005; Service 2005). However, inconsistencies in survey methods over the years (i.e., non-consecutive survey years, incomplete surveys, and variable sampling methodology) have made direct comparisons of data difficult. Also, the naming convention of the sites has been at issue over the years. Therefore, an effort was made prior to the 2003 survey to reconcile site names with previous year's data. As a result, some sites were combined and some were separated based on the presence of protective enclosures.

As part of the conservation strategy, a protocol was developed and implemented that includes a census of known populations and systematic searches of areas supporting unoccupied, potentially suitable habitat (Pavlik *et al.* 2002). Beginning in 2001, the annual survey was designed to expand on previous efforts through the collection of data on habitat variables that will assist in elucidating the distribution patterns and abundance of *R. subumbellata*. The annual survey includes collection of information on occurrence size, number of stems, and other habitat characteristics.

The annual lake-wide survey for *R. subumbellata* is consistently conducted during the week following Labor Day in early September. Participants typically include staff from TRPA, the Service, USFS, NDSP, NDF, Nevada Natural Heritage Program (NNHP), CDFG, CDPR, CSLC,

and the Tahoe Lakefront Owners' Association. Participants are divided into teams that survey the known, historical, and potential habitat sites by covering the entire width of the beach, from waters edge to the backshore. Land use (type and disturbance) and search effort are recorded at both occupied and unoccupied sites. Search effort is defined as the amount of person minutes spent actively searching for and/or collecting data on *R. subumbellata*. Site boundaries are delineated using GPS technology and are generally defined either by natural (i.e., river mouth or substrate change) or artificial features that restrict the surveyor's lateral movement across the lakeshore (i.e., changes in ownership, jetties, and fences).

For sites supporting *R. subumbellata* surveyors estimated general habitat parameters across the entire site, with GPS data obtained for each "cluster" of plants within the site boundaries. To better characterize the occupied habitat, the physical and biological attributes are recorded for each individual cluster. A cluster is defined as a group of plants that occur within 21 ft (6.5 m) diameter of each other. This distance equates to the resolution capability for point data using handheld GPS units. Information specific to each cluster was also collected including the actual or estimated number plants, actual or estimated of plants in each phenological stage, and minimum and maximum rosette diameter. Additional physical and biological attributes were recorded for each cluster including slope, distance to lake, substrate/soil cover, and percent cover of associated plant species. These data are compiled and maintained by the NNHP.

COORDINATION WITH STATES

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment: Nevada and California.

Indicate which State(s) did not provide any information or comments:

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